Fire (Clouds) Breakout Group

Goal: starting today, in the next weeks, collectively or individually, generate specific, detailed, hypothetical flight plans (scorecards) that address important science goals. The flight plans must be realistic in face of natural variability in fire (and clouds) and typical lead times needed for implementation.

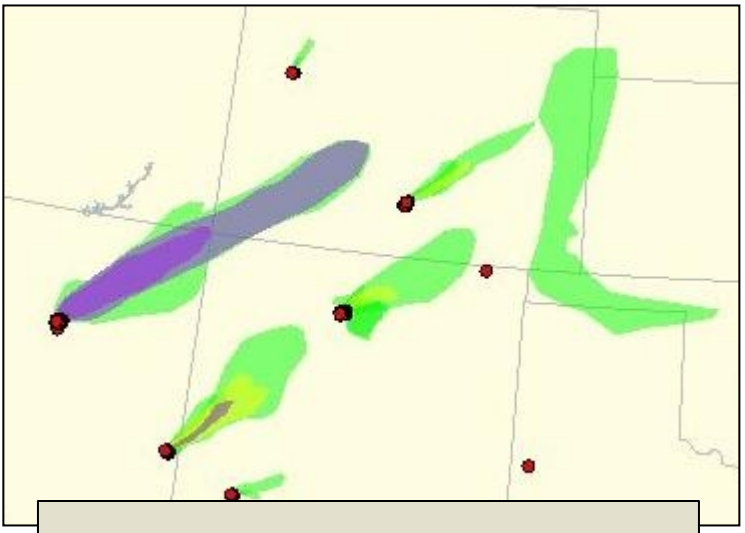
Variability examples >

Single Fire Level: Emissions can change dramatically within minutes or over the diurnal cycle. (aircraft faster than wind).

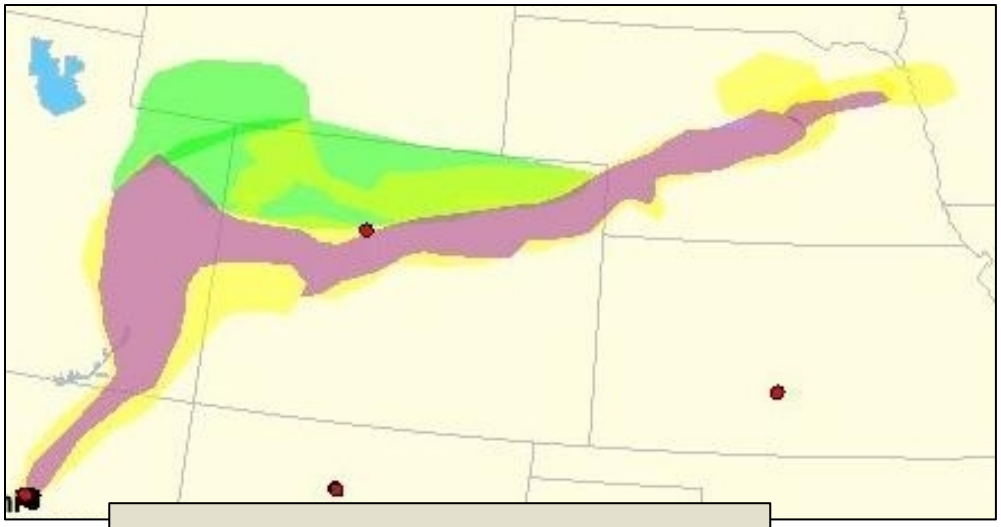
Group Fire Level: Adjacent fires can produce very different emissions and their plumes can mix.

Even prescribed fires planned weeks in advance frequently get rescheduled.

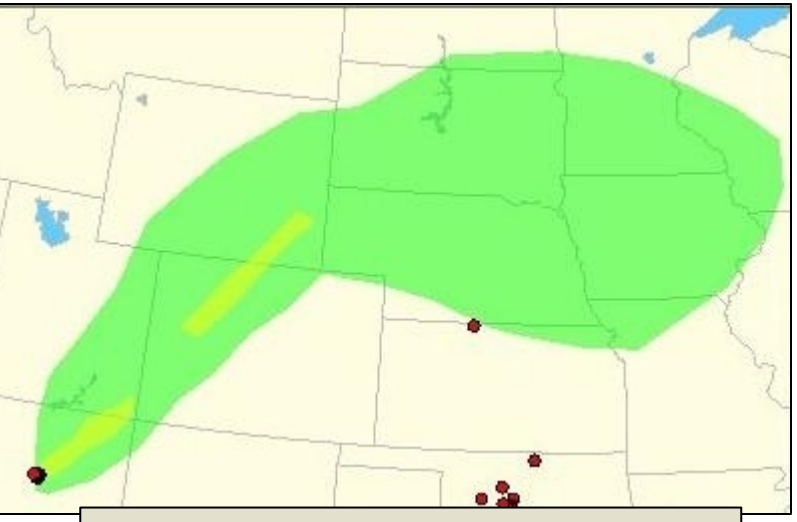
Regional level: Fire activity can surge and wane on time scale of 1-50 days.



June 21, 1224 UTC



June 21, 1846 UTC



June 22, 1721 UTC

June 24, 1958 UTC

Persistent episode, nice plumes, mixed age/source haze, & backup plans.

ER-2 Above haze and MSU Lidar

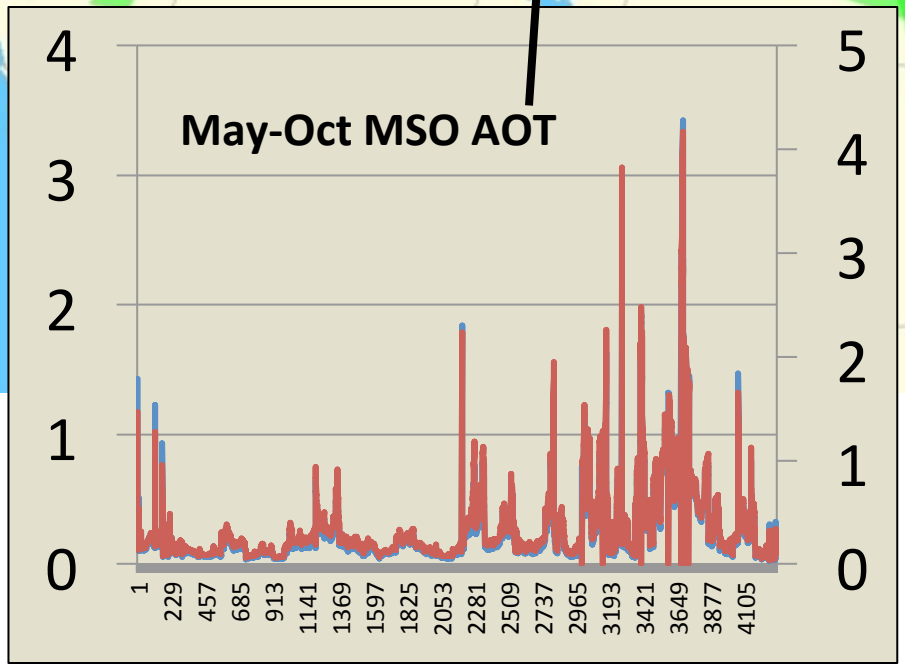
Plan B Fracking

BBOP

DC-8 Regional aged smoke/haze

MCS Cloud/ smoke interactions

Plan C Isoprene



8/31/2012

Ideas > Flight Plans

Which kind of smoke for your science: Plumes or regional haze? Recalling: Rapid early aging (harder target)
Regional haze (mixed age, mixed sources)

Photochemical evolution: no cloud processing, BL and/or FT

Cloud processing: Convective (ice/warm, short residence)
And/or Embedded Cumulus (warm aqueous reactors)?
Smoke impacts on clouds vs Cloud impacts on smoke?

Interactions with urban or biogenic?

Optimize ER2 and DC8 make use of ground observations.
SCORECARDS (Meteorology, instruments, flight tracks, etc)

Moving forward

Strong interest in both regional haze and plumes.

Chemists: strong interest in plume studies. Plumes as target A, Haze as B, interactions as C, etc

Radiation: strong interest in multilevel sampling by DC-8 below within and above plumes or haze layers. With ER-2 above!

Doing VPs or multilevel at various downwind distances in plumes or exported haze.

Score card flight plans can be a whole flight or modules we can bundle into a flight.

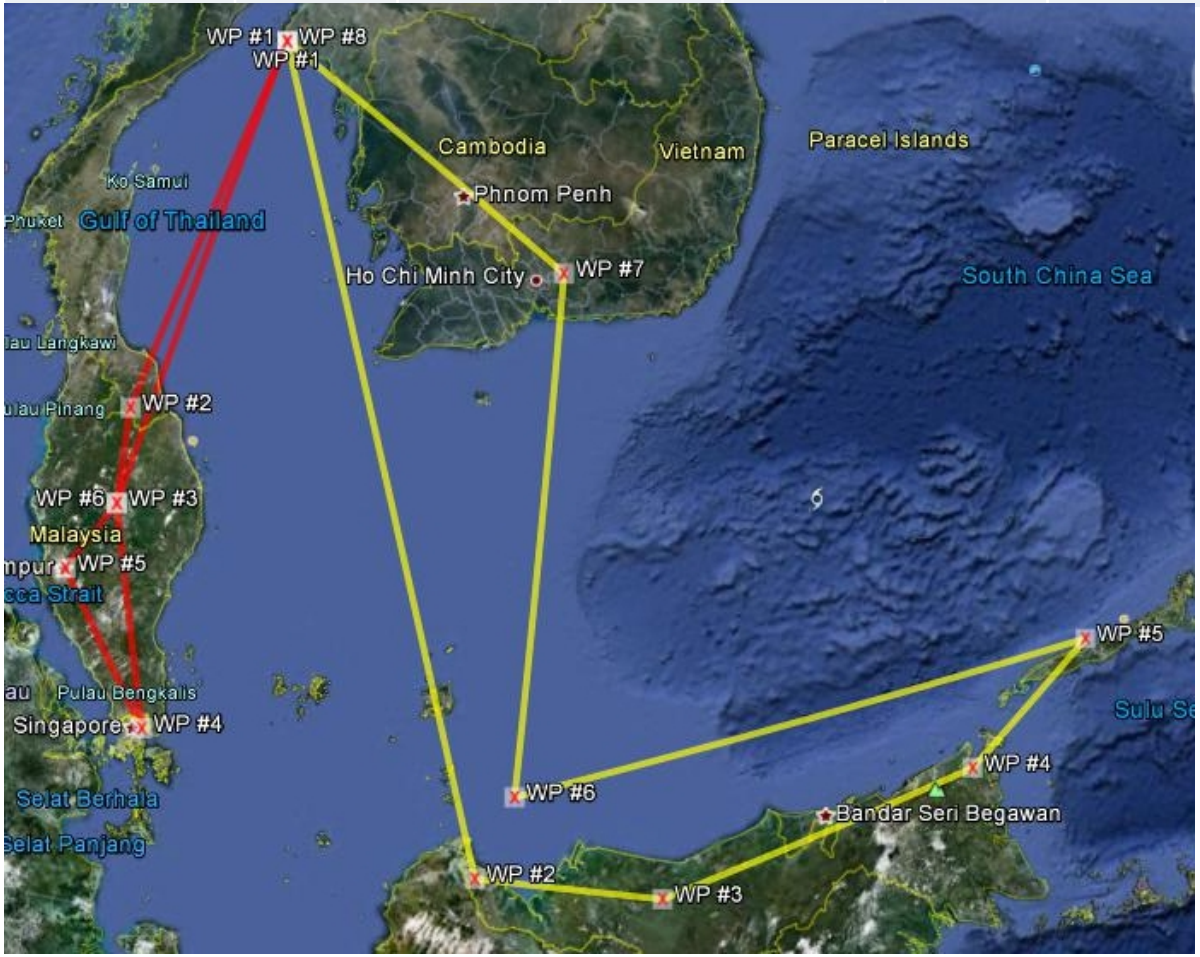
Make it clear what conditions are needed so we can assess if a good day for your flight plan.

Develop as individuals, like-minded groups or cross-cutting groups (chem/rad geographic). Email me, others.

Realistic in terms of aircraft capabilities.

Use Jim Crawford's Flight Planning software, etc

WP	lat	long	m/s	tim-cum	leg time	km-leg	km-cum	kts-leg	kts-cum	kts
UTP	12.6799	101.005	180	0:00	0	0	0	0	0	350
Kuching	1.5	110	180	2:28	2:28	1588.74	1588.74	857.85	857.85	350
Spore	1.3568	103.989	180	3:29	1:02	667.95	2256.69	360.67	1218.52	350
Malacca	1.3568	103	180	3:40	0:11	109.87	2366.57	59.33	1277.84	350
Malacca	3.166	100.5	180	4:11	0:32	342.74	2709.31	185.07	1462.91	350
UTP	12.6799	101.005	180	5:49	1:39	1058.69	3768	571.65	2034.56	350



Allow time for in-situ sampling

Need an approach that's practical for the DC8 and GV

The single long-axis sample "time-machine" flight plan works sometime. DC8, GV alt.

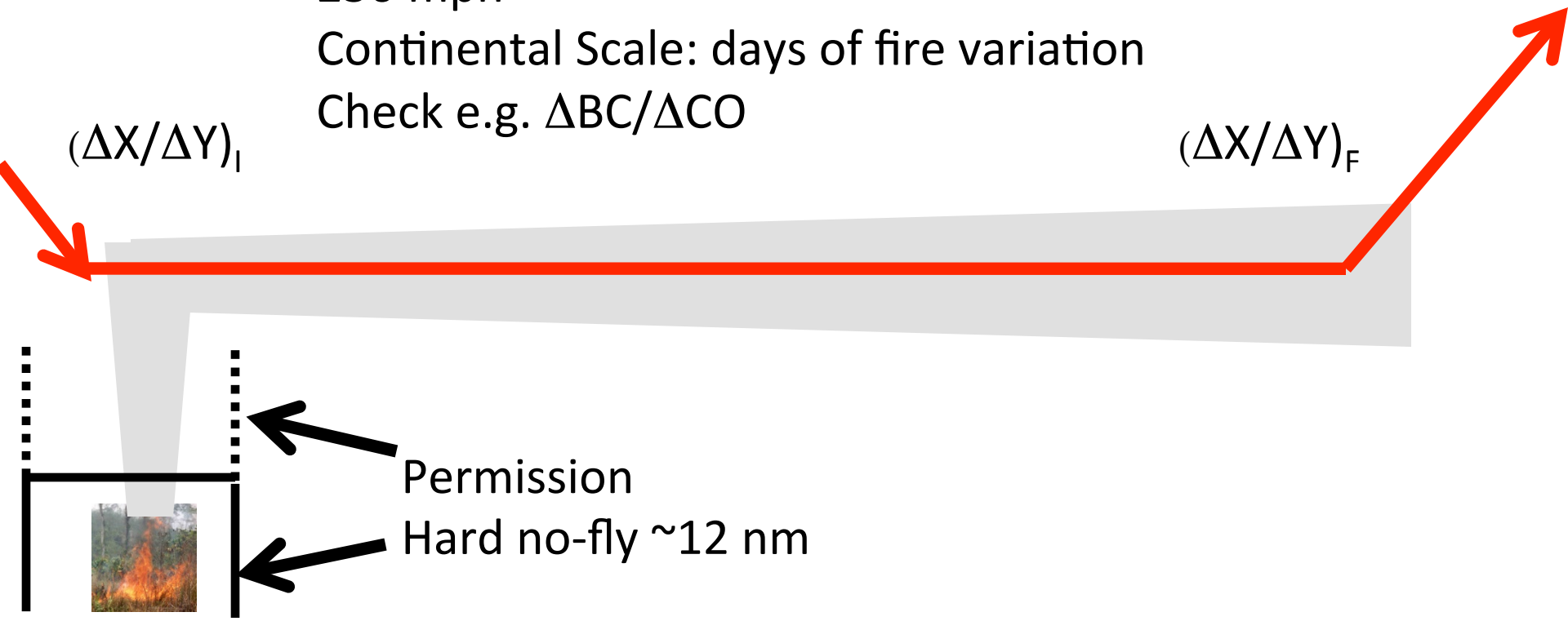
Windspeed 10-40 mph Aircraft speed 250 mph

Continental Scale: days of fire variation

Check e.g. $\Delta BC/\Delta CO$

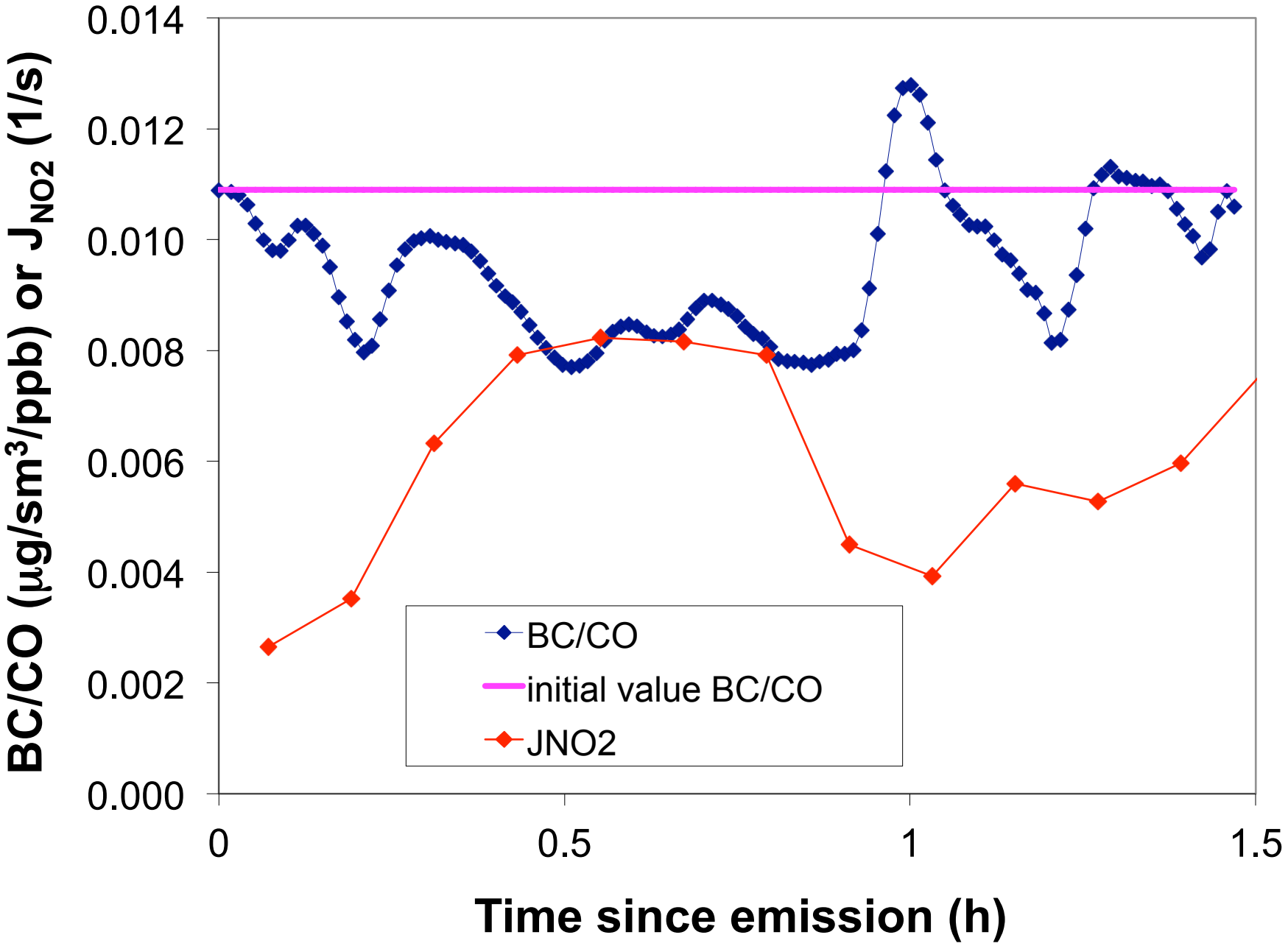
$(\Delta X/\Delta Y)_I$

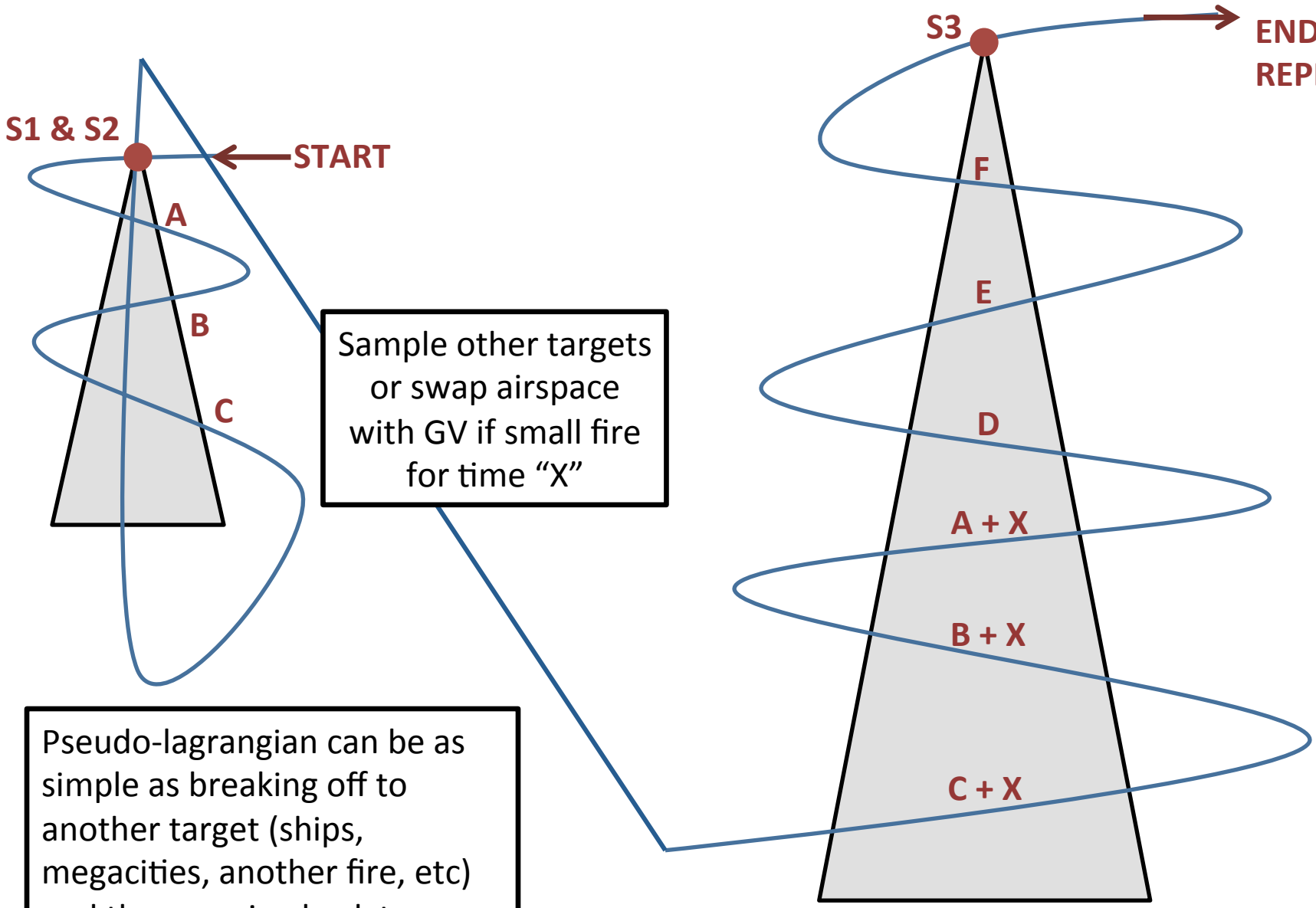
$(\Delta X/\Delta Y)_F$



Permission

Hard no-fly ~12 nm


0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
BC/CO (µg/sm³/ppb) or J_NO2 (1/s)
0
0.5
1
1.5
Time since emission (h)
BC/CO
initial value BC/CO
JNO2

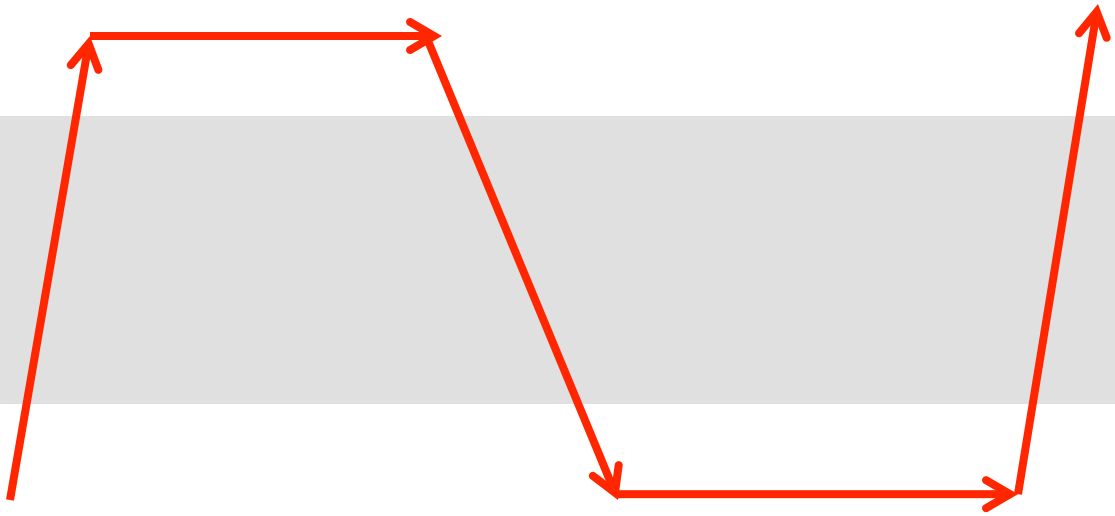


Pseudo-lagrangian can be as simple as breaking off to another target (ships, megacities, another fire, etc) and then coming back to projected downwind location later.

This could work for convective outflow too!

WIND >

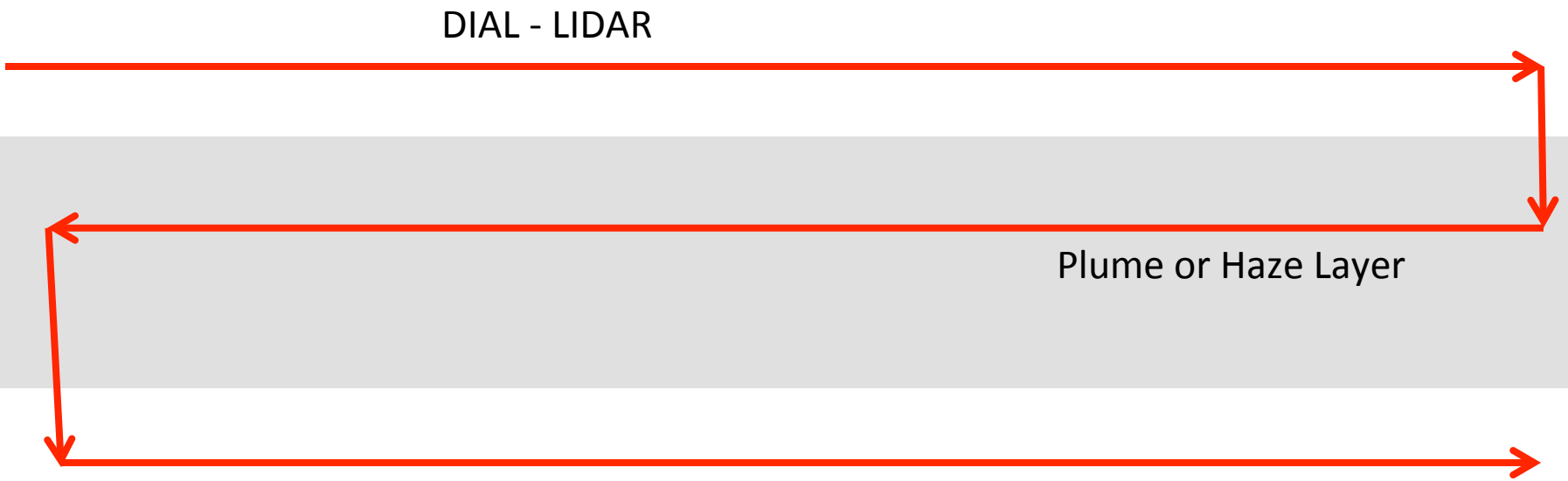
ER-2 ?



Plume or Haze Layer

WIND >

ER-2 ?



Which flight plan is more efficient? Which will have more useful interpretation later? PI knowledge critical here.